

Table 1
Inputs for Foreclosure Incentive Analysis

Cable System Data

US Multichannel Subscribers (millions) ¹	77.950
TCI Subscribers (millions) ²	31.180
Cablevision Subscribers (millions) ³	2.844
Average Cable System Annual Operating Margin (\$/subscriber) ⁴	327.256

Program Service Data

	<u>Discovery Channel</u>	<u>AMC</u>
Annual Affiliate Fee per Subscriber (\$/subscriber) ⁵	1.928	2.067
Annual Net Revenue per Subscriber (\$/subscriber) ⁶	4.921	2.067
Penetration of Multichannel Subscribers ⁷	98.374%	90.921%
TCI-Service Subscribers (millions) ⁸	30.673	28.349
Cablevision-Service Subscribers (millions) ⁸	2.798	2.586

Notes and Sources:

All data are as of December 1997, except US multichannel subscriber data which is as of July 1998.

¹ "Comments of the National Cable Television Association," In the Matter of Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming," July 31, 1998, p. 6.

² TCI subscribers assumed to equal 40 percent of US multichannel subscribers.

³ Paul Kagan Associates, *Cable TV Investor*, February 24, 1998.

⁴ Veronis, Suhler & Associates, *Communications Industry Forecast*, 1997, pp. 156, 160, 177, 179, 185, 189.

Paul Kagan Associates, *Pay TV Newsletter*, April, 30, 1997.

Paul Kagan Associates, *Cable TV Investor*, May 20, 1997.

⁵ Paul Kagan Associates, *Economics of Basic Cable Networks 1998*, pp. 23, 479.

⁶ Paul Kagan Associates, *Economics of Basic Cable Networks 1998*, pp. 23, 483.

⁷ Paul Kagan Associates, *Economics of Basic Cable Networks 1998*, pp. 23, 25.

⁸ Derived.

Table 2A
Calculation of the Effect on TCI Annual Profits of the Failure to Carry
a Service that Competes with Discovery Channel

<u>Parameters</u>	<u>Assumed Parameter Values</u>	
Increase in Discovery Revenue per Subscriber Due to Foreclosure	5.000%	
Lost Subscribers on Foreclosing Cable Systems	1.000%	
TCI Ownership Share in Cablevision	0.000%	
TCI Control Share in Cablevision	0.000%	
	<u>Parameters and Intermediate Effects</u>	<u>Effects on TCI Profits</u>
I. Simplified Arithmetic of Impact on TCI Profits of an Increase in Discovery Affiliate Fee and Advertising Revenue		
Average Discovery Affiliate Fee (\$/subscriber)	1.928	
Increase in Discovery Affiliate Fee (\$/subscriber)	0.096	
TCI-Discovery Subscribers (millions)	30.673	
A Cost to TCI Cable Systems of Discovery Fee Increase (\$ millions)		(2.957)
Discovery Net Revenue (\$ millions)	377.392	
Increase in Discovery Net Revenue (\$ millions)	18.870	
TCI Ownership Share in Discovery	49.000%	
B TCI Share of Increase in Discovery Revenue (\$ millions)		<u>9.246</u>
Net Profit (Loss) to TCI (A + B)		6.289
II. Refinements of Simplified Arithmetic		
Rival Service Affiliate Fee (\$/subscriber)	1.928	
TCI-Rival Service Subscribers (millions)	30.673	
A TCI Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)		59.149
TCI Cable System New Operating Margin per Subscriber (\$/subscriber)	329.088	
Lost TCI Subscribers from Foreclosing Rival Service (millions)	0.307	
B Foregone TCI Cable System Profits from Lost Subscribers (\$ millions)		(100.941)
Average Discovery Revenue After Increase (\$/subscriber)	5.168	
Lost TCI-Discovery Subscribers from Foreclosing Rival Service (millions)	0.307	
Foregone Discovery Revenue from Lost Subscribers (\$ millions)	(1.585)	
TCI Ownership Share in Discovery	49.000%	
C TCI Share of Foregone Discovery Revenue from Lost Subscribers (\$ millions)		<u>(0.777)</u>
Net Profit (Loss) to TCI (A + B + C)		<u>(42.569)</u>
Net Change in TCI Profit (Loss) Across Both Modules (\$ millions)		(36.280)
Sensitivity		
	<u>Case Illustrated Above</u>	<u>Case Resulting in No Net Gain to TCI</u>
TCI Change in Profits (\$ millions)	(36.280)	0.000
Total TCI and Cablevision Subscribers Lost Due to Foreclosure (millions)	0.307	0.197
Percent Foreclosable Subscribers Lost	1.000%	0.643%

Table 2B
Calculation of the Effect on TCI Annual Profits of the Failure to Carry
a Service that Competes with Discovery Channel

<u>Parameters</u>		<u>Assumed Parameter Values</u>	
Increase in Discovery Revenue per Subscriber Due to Foreclosure		10.000%	
Lost Subscribers on Foreclosing Cable Systems		1.000%	
TCI Ownership Share in Cablevision		33.000%	
TCI Control Share in Cablevision		33.000%	
		<u>Parameters and Intermediate Effects</u>	<u>Effects on TCI Profits</u>
I. Simplified Arithmetic of Impact on TCI Profits of an Increase in Discovery Affiliate Fee and Advertising Revenue			
Average Discovery Affiliate Fee (\$/subscriber)		1.928	
Increase in Discovery Affiliate Fee (\$/subscriber)		0.193	
TCI-Discovery Subscribers (millions)		30.673	
A1	Cost to TCI Cable Systems of Discovery Fee Increase (\$ millions)		(5.915)
Average Discovery Affiliate Fee (\$/subscriber)		1.928	
Increase in Discovery Affiliate Fee (\$/subscriber)		0.193	
Cablevision-Discovery Subscribers (millions)		2.798	
Cost to Cablevision Cable Systems of Discovery Fee Increase (\$ millions)		(0.540)	
A2	TCI Share of Cost to Cablevision (\$ millions)		(0.178)
Discovery Net Revenue (\$ millions)		377.392	
Increase in Discovery Net Revenue (\$ millions)		37.739	
TCI Ownership Share in Discovery		49.000%	
B	TCI Share of Increase in Discovery Revenue (\$ millions)		18.492
Net Profit (Loss) to TCI (A1 + A2 + B)			12.399
II. Refinements of Simplified Arithmetic			
Rival Service Affiliate Fee (\$/subscriber)		1.928	
TCI-Rival Service Subscribers (millions)		30.673	
A1	TCI Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)		59.149
Rival Service Affiliate Fee (\$/subscriber)		1.928	
TCI-Controlled Cablevision-Rival Service Subscribers (millions)		0.923	
Cablevision Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)		1.780	
A2	TCI Share of Avoided Cablevision Cost (\$ millions)		0.588
TCI Cable System New Operating Margin per Subscriber (\$/subscriber)		328.992	
Lost TCI Subscribers from Foreclosing Rival Service (millions)		0.307	
B1	Foregone TCI Cable System Profits from Lost Subscribers (\$ millions)		(100.912)
Cablevision Cable System New Operating Margin per Subscriber (\$/subscriber)		328.992	
Lost TCI-Controlled Cablevision Subscribers from Foreclosing Rival Service (millions)		0.009	
Foregone Cablevision Cable System Profits from Lost Subscribers (\$ millions)		(3.037)	
B2	TCI Share of Foregone Cablevision Profits from Lost Subscribers (\$ millions)		(1.002)
Average Discovery Revenue After Increase (\$/subscriber)		5.414	
Lost TCI-Discovery Subscribers from Foreclosing Rival Service (millions)		0.307	
Lost TCI-Controlled Cablevision-Discovery Subscribers from Foreclosing Rival Service (millions)		0.009	
Foregone Discovery Revenue from Lost Subscribers (\$ millions)		(1.711)	
TCI Ownership Share in Discovery		49.000%	
C	TCI Share of Foregone Discovery Revenue from Lost Subscribers (\$ millions)		(0.838)
Net Profit (Loss) to TCI (A1 + A2 + B1 + B2 + C)			(43.016)
Net Change in TCI Profit (Loss) Across Both Modules (\$ millions)			(30.616)
Sensitivity			
		<u>Case Illustrated Above</u>	<u>Case Resulting in No Net Gain to TCI</u>
TCI Change in Profits (\$ millions)		(30.616)	(0.000)
Total TCI and Cablevision Subscribers Lost Due to Foreclosure (millions)		0.316	0.222
Percent Foreclosable Subscribers Lost		1.000%	0.702%

Table 2C
Calculation of the Effect on TCI Annual Profits of the Failure to Carry
a Service that Competes with Discovery Channel

Parameters		Assumed Parameter Values	
Increase in Discovery Revenue per Subscriber Due to Foreclosure		20.000%	
Lost Subscribers on Foreclosing Cable Systems		1.000%	
TCI Ownership Share in Cablevision		33.000%	
TCI Control Share in Cablevision		100.000%	
		Parameters and Intermediate Effects	Effects on TCI Profits
I. Simplified Arithmetic of Impact on TCI Profits of an Increase in Discovery Affiliate Fee and Advertising Revenue			
	Average Discovery Affiliate Fee (\$/subscriber)	1.928	
	Increase in Discovery Affiliate Fee (\$/subscriber)	0.386	
	TCI-Discovery Subscribers (millions)	30.673	
A1	Cost to TCI Cable Systems of Discovery Fee Increase (\$ millions)		(11.830)
	Average Discovery Affiliate Fee (\$/subscriber)	1.928	
	Increase in Discovery Affiliate Fee (\$/subscriber)	0.386	
	Cablevision-Discovery Subscribers (millions)	2.798	
	Cost to Cablevision Cable Systems of Discovery Fee Increase (\$ millions)	(1.079)	
A2	TCI Share of Cost to Cablevision (\$ millions)		(0.356)
	Discovery Net Revenue (\$ millions)	377.392	
	Increase in Discovery Net Revenue (\$ millions)	75.478	
	TCI Ownership Share in Discovery	49.000%	
B	TCI Share of Increase in Discovery Revenue (\$ millions)		<u>36.984</u>
	Net Profit (Loss) to TCI (A1 + A2 + B)		24.799
II. Refinements of Simplified Arithmetic			
	Rival Service Affiliate Fee (\$/subscriber)	1.928	
	TCI-Rival Service Subscribers (millions)	30.673	
A1	TCI Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)		59.149
	Rival Service Affiliate Fee (\$/subscriber)	1.928	
	TCI-Controlled Cablevision-Rival Service Subscribers (millions)	2.798	
	Cablevision Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)	5.395	
A2	TCI Share of Avoided Cablevision Cost (\$ millions)		1.780
	TCI Cable System New Operating Margin per Subscriber (\$/subscriber)	328.799	
	Lost TCI Subscribers from Foreclosing Rival Service (millions)	0.307	
B1	Foregone TCI Cable System Profits from Lost Subscribers (\$ millions)		(100.853)
	Cablevision Cable System New Operating Margin per Subscriber (\$/subscriber)	328.799	
	Lost TCI-Controlled Cablevision Subscribers from Foreclosing Rival Service (millions)	0.028	
	Foregone Cablevision Cable System Profits from Lost Subscribers (\$ millions)	(9.199)	
B2	TCI Share of Foregone Cablevision Profits from Lost Subscribers (\$ millions)		(3.036)
	Average Discovery Revenue After Increase (\$/subscriber)	5.906	
	Lost TCI-Discovery Subscribers from Foreclosing Rival Service (millions)	0.307	
	Lost TCI-Controlled Cablevision-Discovery Subscribers from Foreclosing Rival Service (millions)	0.028	
	Foregone Discovery Revenue from Lost Subscribers (\$ millions)	(1.977)	
	TCI Ownership Share in Discovery	49.000%	
C	TCI Share of Foregone Discovery Revenue from Lost Subscribers (\$ millions)		(0.969)
	Net Profit (Loss) to TCI (A1 + A2 + B1 + B2 + C)		<u>(43.927)</u>
	Net Change in TCI Profit (Loss) Across Both Modules (\$ millions)		(19.129)
Sensitivity			
	TCI Change in Profits (\$ millions)	<u>Case Illustrated Above</u>	<u>Case Resulting in No Net Gain to TCI</u>
	Total TCI and Cablevision Subscribers Lost Due to Foreclosure (millions)	(19.129)	0.000
	Percent Foreclosable Subscribers Lost	0.335	0.274
		1.000%	0.818%

Table 3A
Calculation of the Effect on TCI Annual Profits of the Failure to Carry
a Service that Competes with AMC

Parameters		Assumed Parameter Values	
Increase in AMC Revenue per Subscriber Due to Foreclosure		5.000%	
Lost Subscribers on Foreclosing Cable Systems		1.000%	
TCI Ownership Share in Cablevision		33.000%	
TCI Control Share in Cablevision		0.000%	
		Parameters and Intermediate Effects	Effects on TCI Profits
I. Simplified Arithmetic of Impact on TCI Profits of an Increase in AMC Affiliate Fee and Advertising Revenue			
	Average AMC Affiliate Fee (\$/subscriber)	2.067	
	Increase in AMC Affiliate Fee (\$/subscriber)	0.103	
	TCI-AMC Subscribers (millions)	28.349	
A1	Cost to TCI Cable Systems of AMC Fee Increase (\$ millions)		(2.930)
	Average AMC Affiliate Fee (\$/subscriber)	2.067	
	Increase in AMC Affiliate Fee (\$/subscriber)	0.103	
	Cablevision-AMC Subscribers (millions)	2.586	
	Cost to Cablevision Cable Systems of AMC Fee Increase (\$ millions)	(0.267)	
A2	TCI Share of Cost to Cablevision (\$ millions)		(0.088)
	AMC Net Revenue (\$ millions)	146.500	
	Increase in AMC Net Revenue (\$ millions)	7.325	
	TCI Ownership Share in AMC	24.750%	
B	TCI Share of Increase in AMC Revenue (\$ millions)		1.813
	Net Profit (Loss) to TCI (A1 + A2 + B)		(1.205)
II. Refinements of Simplified Arithmetic			
	Rival Service Affiliate Fee (\$/subscriber)	2.067	
	TCI-Rival Service Subscribers (millions)	28.349	
A1	TCI Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)		58.600
	Rival Service Affiliate Fee (\$/subscriber)	2.067	
	TCI-Controlled Cablevision-Rival Service Subscribers (millions)	0.000	
	Cablevision Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)	0.000	
A2	TCI Share of Avoided Cablevision Cost (\$ millions)		0.000
	TCI Cable System New Operating Margin per Subscriber (\$/subscriber)	329.220	
	Lost TCI Subscribers from Foreclosing Rival Service (millions)	0.283	
B1	Foregone TCI Cable System Profits from Lost Subscribers (\$ millions)		(93.332)
	Cablevision Cable System New Operating Margin per Subscriber (\$/subscriber)	329.220	
	Lost TCI-Controlled Cablevision Subscribers from Foreclosing Rival Service (millions)	0.000	
	Foregone Cablevision Cable System Profits from Lost Subscribers (\$ millions)	0.000	
B2	TCI Share of Foregone Cablevision Profits from Lost Subscribers (\$ millions)		0.000
	Average AMC Revenue After Increase (\$/subscriber)	2.170	
	Lost TCI-AMC Subscribers from Foreclosing Rival Service (millions)	0.283	
	Lost TCI-Controlled Cablevision-AMC Subscribers from Foreclosing Rival Service (millions)	0.000	
	Foregone AMC Revenue from Lost Subscribers (\$ millions)	(0.615)	
	TCI Ownership Share in AMC	24.750%	
C	TCI Share of Foregone AMC Revenue from Lost Subscribers (\$ millions)		(0.152)
	Net Profit (Loss) to TCI (A1 + A2 + B1 + B2 + C)		(34.884)
Net Change in TCI Profit (Loss) Across Both Modules (\$ millions)			(36.089)
Sensitivity			
	TCI Change in Profits (\$ millions)	Case Illustrated Above	Case Resulting in No Net Gain to TCI
	Total TCI and Cablevision Subscribers Lost Due to Foreclosure (millions)	(36.089)	0.000
	Percent Foreclosable Subscribers Lost	0.283	0.174
		1.000%	0.614%

Table 3B
Calculation of the Effect on TCI Annual Profits of the Failure to Carry
a Service that Competes with AMC

<u>Parameters</u>		<u>Assumed Parameter Values</u>	
Increase in AMC Revenue per Subscriber Due to Foreclosure		10.000%	
Lost Subscribers on Foreclosing Cable Systems		1.000%	
TCI Ownership Share in Cablevision		33.000%	
TCI Control Share in Cablevision		33.000%	
		<u>Parameters and Intermediate Effects</u>	<u>Effects on TCI Profits</u>
I. Simplified Arithmetic of Impact on TCI Profits of an Increase in AMC Affiliate Fee and Advertising Revenue			
	Average AMC Affiliate Fee (\$/subscriber)	2.067	
	Increase in AMC Affiliate Fee (\$/subscriber)	0.207	
	TCI-AMC Subscribers (millions)	28.349	
A1	Cost to TCI Cable Systems of AMC Fee Increase (\$ millions)		(5.860)
	Average AMC Affiliate Fee (\$/subscriber)	2.067	
	Increase in AMC Affiliate Fee (\$/subscriber)	0.207	
	Cablevision-AMC Subscribers (millions)	2.586	
	Cost to Cablevision Cable Systems of AMC Fee Increase (\$ millions)	(0.535)	
A2	TCI Share of Cost to Cablevision (\$ millions)		(0.176)
	AMC Net Revenue (\$ millions)	146.500	
	Increase in AMC Net Revenue (\$ millions)	14.650	
	TCI Ownership Share in AMC	24.750%	
B	TCI Share of Increase in AMC Revenue (\$ millions)		3.626
	Net Profit (Loss) to TCI (A1 + A2 + B)		(2.411)
II. Refinements of Simplified Arithmetic			
	Rival Service Affiliate Fee (\$/subscriber)	2.067	
	TCI-Rival Service Subscribers (millions)	28.349	
A1	TCI Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)		58.600
	Rival Service Affiliate Fee (\$/subscriber)	2.067	
	TCI-Controlled Cablevision-Rival Service Subscribers (millions)	0.853	
	Cablevision Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)	1.764	
A2	TCI Share of Avoided Cablevision Cost (\$ millions)		0.582
	TCI Cable System New Operating Margin per Subscriber (\$/subscriber)	329.117	
	Lost TCI Subscribers from Foreclosing Rival Service (millions)	0.283	
B1	Foregone TCI Cable System Profits from Lost Subscribers (\$ millions)		(93.302)
	Cablevision Cable System New Operating Margin per Subscriber (\$/subscriber)	329.117	
	Lost TCI-Controlled Cablevision Subscribers from Foreclosing Rival Service (millions)	0.009	
	Foregone Cablevision Cable System Profits from Lost Subscribers (\$ millions)	(2.808)	
B2	TCI Share of Foregone Cablevision Profits from Lost Subscribers (\$ millions)		(0.927)
	Average AMC Revenue After Increase (\$/subscriber)	2.274	
	Lost TCI-AMC Subscribers from Foreclosing Rival Service (millions)	0.283	
	Lost TCI-Controlled Cablevision-AMC Subscribers from Foreclosing Rival Service (millions)	0.009	
	Foregone AMC Revenue from Lost Subscribers (\$ millions)	(0.664)	
	TCI Ownership Share in AMC	24.750%	
C	TCI Share of Foregone AMC Revenue from Lost Subscribers (\$ millions)		(0.164)
	Net Profit (Loss) to TCI (A1 + A2 + B1 + B2 + C)		(35.211)
Net Change in TCI Profit (Loss) Across Both Modules (\$ millions)			(37.622)
Sensitivity			
	TCI Change in Profits (\$ millions)	Case Illustrated Above	Case Resulting in No Net Gain to TCI
	Total TCI and Cablevision Subscribers Lost Due to Foreclosure (millions)	(37.622)	0.000
	Percent Foreclosable Subscribers Lost	0.292	0.176
		1.000%	0.601%

Table 3C
Calculation of the Effect on TCI Annual Profits of the Failure to Carry
a Service that Competes with AMC

<u>Parameters</u>		<u>Assumed Parameter Values</u>	
Increase in AMC Revenue per Subscriber Due to Foreclosure		20.000%	
Lost Subscribers on Foreclosing Cable Systems		1.000%	
TCI Ownership Share in Cablevision		33.000%	
TCI Control Share in Cablevision		100.000%	
		<u>Parameters and Intermediate Effects</u>	<u>Effects on TCI Profits</u>
I. Simplified Arithmetic of Impact on TCI Profits of an Increase in AMC Affiliate Fee and Advertising Revenue			
	Average AMC Affiliate Fee (\$/subscriber)	2.067	
	Increase in AMC Affiliate Fee (\$/subscriber)	0.413	
	TCI-AMC Subscribers (millions)	28.349	
A1	Cost to TCI Cable Systems of AMC Fee Increase (\$ millions)		(11.720)
	Average AMC Affiliate Fee (\$/subscriber)	2.067	
	Increase in AMC Affiliate Fee (\$/subscriber)	0.413	
	Cablevision-AMC Subscribers (millions)	2.586	
	Cost to Cablevision Cable Systems of AMC Fee Increase (\$ millions)	(1.089)	
A2	TCI Share of Cost to Cablevision (\$ millions)		(0.353)
	AMC Net Revenue (\$ millions)	146.500	
	Increase in AMC Net Revenue (\$ millions)	29.300	
	TCI Ownership Share in AMC	24.750%	
B	TCI Share of Increase in AMC Revenue (\$ millions)		7.252
	Net Profit (Loss) to TCI (A1 + A2 + B)		(4.821)
II. Refinements of Simplified Arithmetic			
	Rival Service Affiliate Fee (\$/subscriber)	2.067	
	TCI-Rival Service Subscribers (millions)	28.349	
A1	TCI Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)		58.600
	Rival Service Affiliate Fee (\$/subscriber)	2.067	
	TCI-Controlled Cablevision-Rival Service Subscribers (millions)	2.586	
	Cablevision Cable System Avoided Cost from Foreclosing Rival Service (\$ millions)	5.345	
A2	TCI Share of Avoided Cablevision Cost (\$ millions)		1.764
	TCI Cable System New Operating Margin per Subscriber (\$/subscriber)	328.910	
	Lost TCI Subscribers from Foreclosing Rival Service (millions)	0.283	
B1	Foregone TCI Cable System Profits from Lost Subscribers (\$ millions)		(93.244)
	Cablevision Cable System New Operating Margin per Subscriber (\$/subscriber)	328.910	
	Lost TCI-Controlled Cablevision Subscribers from Foreclosing Rival Service (millions)	0.026	
	Foregone Cablevision Cable System Profits from Lost Subscribers (\$ millions)	(8.505)	
B2	TCI Share of Foregone Cablevision Profits from Lost Subscribers (\$ millions)		(2.807)
	Average AMC Revenue After Increase (\$/subscriber)	2.480	
	Lost TCI-AMC Subscribers from Foreclosing Rival Service (millions)	0.283	
	Lost TCI-Controlled Cablevision-AMC Subscribers from Foreclosing Rival Service (millions)	0.026	
	Foregone AMC Revenue from Lost Subscribers (\$ millions)	(0.767)	
	TCI Ownership Share in AMC	24.750%	
C	TCI Share of Foregone AMC Revenue from Lost Subscribers (\$ millions)		(0.190)
	Net Profit (Loss) to TCI (A1 + A2 + B1 + B2 + C)		(35.877)
	Net Change in TCI Profit (Loss) Across Both Modules (\$ millions)		(40.698)
Sensitivity			
	TCI Change in Profits (\$ millions)	Case Illustrated Above	Case Resulting in No Net Gain to TCI
	Total TCI and Cablevision Subscribers Lost Due to Foreclosure (millions)	(40.698)	0.000
	Percent Foreclosable Subscribers Lost	0.309	0.179
		1.000%	0.577%

Appendix C

HOW CROSS-OWNERSHIP MITIGATES DOUBLE-MARGINALIZATION

Appendix C

HOW CROSS-OWNERSHIP MITIGATES DOUBLE-MARGINALIZATION

C.1. Introduction

This appendix explains how partial ownership interests by cable operators in other cable operators can mitigate the double-marginalization problem that arises when the acquiring or the acquired cable operator owns one or more program services. We examine two simple theoretical cases that illustrate this point. First, we consider the effects of an upstream supplier of an input (e.g., a programmer) taking a partial ownership interest in a downstream firm (e.g., a cable operator) that sells the product or service in a final market. Second, we consider the effects of a downstream firm taking a partial ownership interest in an upstream supplier.

For simplicity, we consider an example in which a single upstream firm sells an input used in fixed proportions by a single downstream firm to produce a service. We assume that one unit of the input is used to produce one unit of output. The demand for the downstream firm's service is $D(P)$ where P is the price it charges its customers. The downstream firm's profits are $\pi^d = (P - w)D(P)$ where w is the per-unit price it pays the upstream firm for the service. The upstream firm produces at zero marginal cost and earns profits $\pi^u = wD(P)$.

Pricing decisions are made in the standard two-stage game framework. The upstream firm first sets the input price w , then the downstream firm sets the final price P . Each firm chooses its price to maximize its profits. The

downstream firm does so taking the price set by the upstream firm as given; the upstream firm does so with an understanding of how the input price will affect the downstream firm's pricing incentives.¹

It is well known that independent, per-unit pricing by successive monopolists results in double-marginalization, which leads to a higher final price than a vertically integrated monopolist would set. The next two subsections show that partial ownership interests can mitigate or eliminate double-marginalization and thereby reduce the final price and increase subscribership.

C.2. Upstream Firm Acquires Partial Interest in a Downstream Firm

Suppose that the owner of the upstream firm takes a silent financial interest of α in the downstream firm. Since the partial interest is silent, the downstream firm's profit objective does not change; it still chooses its price P to maximize its profits π^d . Let $P(w)$ be the downstream firm's optimal price² for any given w , and write its maximized profits for any w as $\pi^d(w) = (P(w) - w)D(P(w))$.

The silent financial interest does change the upstream firm's objective because the wholesale price it chooses will affect its share of downstream profits. Let $\pi^u(w) = wD(P(w))$ be the upstream profits conditional on any input price w . The upstream firm's profit objective given its partial interest α in the downstream firm is then $\pi^{u\alpha}(w) = \pi^u(w) + \alpha\pi^d(w)$. We assume that $\pi^{u\alpha}$ is strictly quasi-concave in w .

We now demonstrate that an increase in the upstream firm's silent financial interest in the downstream firm results in lower prices for the input and

¹ Technically, the equilibrium strategies will be subgame perfect.

² We assume that $P(w)$ exists and is unique.

the final product. The upstream firm's first order condition for profit maximization is

$$(1) \quad \pi_w^u + \alpha \pi_w^d = 0$$

where subscripts denote derivatives. Totally differentiating (1) with respect to α yields

$$(2) \quad \frac{\partial w}{\partial \alpha} = - \frac{\pi_w^d}{\pi_{ww}^u + \alpha \pi_{ww}^d}$$

which measures how the input price changes when the partial ownership share changes. The denominator of (2) is negative by the assumption that the upstream firm's objective function is strictly quasi-concave. The numerator of (2) is negative by the well known comparative statics result that a monopolist's profit is strictly decreasing in its marginal cost.³ Thus, $\partial w / \partial \alpha < 0$; i.e., *the input price falls when the upstream firm's silent financial interest in the downstream firm increases*. Since the downstream firm's price is increasing in its marginal cost,⁴ the downstream firm's price falls as the input price falls. Thus, *the downstream price falls when the upstream firm's silent financial interest in the downstream firm increases*. In particular, any silent financial interest by the upstream firm in

³ By the envelope theorem, $\partial \pi^d / \partial w = -D(P(w)) < 0$.

⁴ The first order condition for the downstream firm is $D + (P - w)D_P = 0$. Totally differentiating with respect to w , we find that $\partial P / \partial w = -D_P / \pi_{PP}^d$ which is positive by the assumption that π^d is strictly quasi-concave.

the downstream firm leads to a lower final price than no partial ownership interest.

Thus far we have assumed that the upstream firm's partial investment is a silent financial interest that confers no control. It is not difficult to see that double marginalization is attenuated further when the upstream firm gains complete control of the downstream firm. In this case the upstream firm will set the downstream price as low as possible consistent with keeping the downstream firm profitable, i.e., $P=w$. The upstream firm's profits then become

$$(3) \quad wD(P) + \alpha(P-w)D(P) = PD(P) + \alpha(P-P)D(P) = PD(P).$$

Notice that the upstream firm's profit objective, $PD(P)$, is the same as that of a vertically integrated firm. Thus, *effective control over the downstream firm eliminates double-marginalization, leading to a lower final price.*

C.3. Downstream Firm Acquires a Partial Interest in the Upstream Firm

Next, suppose the downstream firm takes a silent financial interest α in the upstream firm. The downstream firm's profit objective then becomes

$$(P-w)D(P) + \alpha wD(P) = [P - (1-\alpha)w]D(P) = (P-w')D(P)$$

where $w' = (1-\alpha)w$. The downstream firm's profit maximizing price is then $P(w')$.

We will refer to w' as the "ownership-adjusted" input price because it reflects the fact that the downstream firm's effective input price is reduced by the amount of its partial ownership interest in the upstream firm.

Given the downstream firm's pricing decision $P(w')$, the upstream firm's optimal wholesale price becomes

$$\begin{aligned}
w^\alpha &= \arg \max_w w D(P((1-\alpha)w)) = \arg \max_{w'} \frac{1}{1-\alpha} w' D(P(w')) \\
&= \frac{1}{1-\alpha} w^*.
\end{aligned}$$

where w^* is the input price chosen absent cross-ownership and the notation “argmax” represents the value of w that maximizes the given expressions. The first equality follows from making the substitution $w'=(1-\alpha)w$. The second equality is true because the solution to a maximization problem does not change when the objective is multiplied by a constant. In words, the effective wholesale price paid by the downstream firm when it has a partial ownership interest of α in the upstream firm is $100\alpha\%$ lower than the price w^* that is chosen absent any cross-ownership, i.e., $w^\alpha=w^*/(1-\alpha)$. This means that the ownership-adjusted price is $(1-\alpha)w^\alpha=(1-\alpha)w^*/(1-\alpha)=w^*$, or that the ownership-adjusted input price is the same as the input price chosen before the partial ownership interest. This also means that the final price is the same with or without the partial ownership interest. Thus, *a silent financial interest by the downstream firm in the upstream firm does not affect the final price.*

Although a silent financial interest by the downstream firm in the upstream firm does not mitigate double-marginalization, a partial investment that involves control does. To see this, suppose the downstream firm controls the input price. Since its profits are a declining function of the ownership-adjusted price $w'=(1-\alpha)w$, the downstream firm wants this price to be as low as possible. This occurs when the input price w equals upstream marginal cost, or in this example, when

$w=0$. But when $w=0$, the downstream firm's profit objective in setting the final price becomes

$$[P-(1-\alpha)w]D(P) = PD(P),$$

which is the same as the objective of a vertically integrated firm. Thus, *a partial investment by the downstream firm in the upstream firm that confers complete control over the upstream firm eliminates double-marginalization and leads to a lower final price.*

It is not difficult to see that a partial ownership interest by the downstream firm in the upstream firm that confers partial control mitigates double marginalization as well. The idea is that the downstream firm benefits from exerting influence on the upstream firm that causes it to reduce the input price. The lower input price causes the downstream firm to reduce the final price.